

OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

CEOCHASMA, A REMARKABLE NEW LAND SNAIL
FROM COLIMA, MEXICO (GASTROPODA,
PROSOBRANCHIA, HELICINIDAE)¹

BY FRED G. THOMPSON

Florida State Museum, University of Florida

While conducting field work in Colima during 1966 the author collected an unusual helicimid snail that has several shell peculiarities. Its radular structure substantiates both its generic distinctness and its isolated phylogenetic position. Features of its inner marginal teeth and its central teeth place the genus in the subfamily Proserpininae, tribe Vianini, but it is distinguished from all members of this subfamily by its more primitive helicimid capituliform complex. The genus and species are described below:

***Ceochasma* new genus**

Type-species: Ceochasma phrixina new species.

Generic Diagnosis: Readily distinguished from all other known members of the family Helicimididae by a deep slitlike sinus that extends back along the suture of the last $\frac{1}{8}$ whorl. *Schazicheila* Shuttleworth and *Viana* H. and A. Adams also have sinuses in the aperture, but the structures differ in the three genera. Some species of *Schazicheila* have a small notch in the upper corner of the peristome, accommodating a small peglike extension of the operculum, and never much deeper than the thickness of the operculum. *Viana* has a deep notch in the outer lip about halfway between the upper corner of the peristome and the periphery. The notch apparently serves as an interlocking device between the two sexes during copulation. The notch develops late in the growth of the shell, and has no similarity in location or structure to that of *Ceochasma*.

Besides the characteristic siphon notch, the shell is readily distin-

¹This work was supported by the National Institutes of Health Research Grant GM 12300.

guished from other Mexican helicinids by its size, shape and sculpture. In these characters it resembles some species of *Helicina* Lamarck, s. g. *Tristramia* Crosse, sec. *Oxyrhombus* Crosse and Fischer, but is distinguished from all species of that section by its much coarser spiral chords.

Ceochasma has an operculum consisting of concentric rings with an acentric nucleus, a well-developed calcareous plate with an oblique lamellarlike projection along the columellar margin, and a horny plate that extends beyond the margin of the calcareous plate. In these characters it resembles *Tristramia*, but the columellar projection is longer than occurs in *Tristramia*, and the nuclear region of the calcareous plate is thinner and more concave.

Etymology: The generic epithet is derived from the Greek κείο, meaning cleft, and χασμα meaning gaping mouth, and alludes to the clefted aperture. The gender of the name is feminine. The specific name is taken from the Greek φρλε and ίνος, and refers to the rippled appearance of the sculpture.

***Ceochasma phrixina* new species**

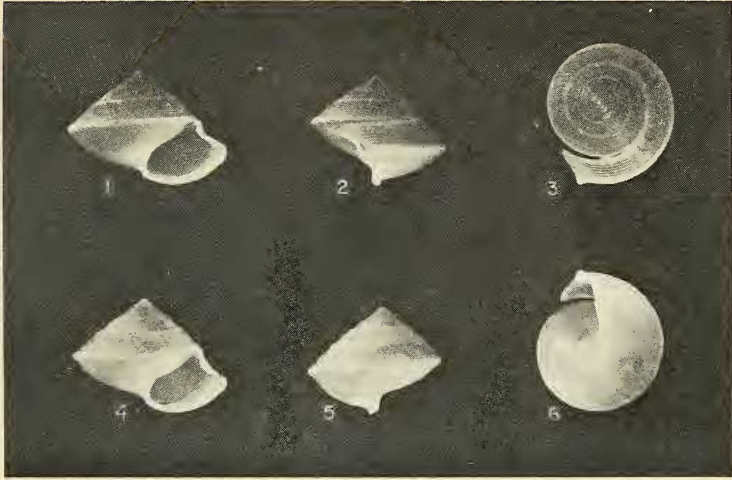
Holotype: University of Florida Collections (UF) 20138, collected 2 August 1966 by Fred G. Thompson.

Paratypes: UF 20139 (16), UMMZ 228990 (5), Museo Nacional de Mexico (3); collected with the holotype. UF 20140 (12); collected 29 May 1966 at the type-locality. UF 20141 (15); collected 30 May 1966 at the type-locality.

Type-locality: A collapsed limestone ridge 0.3 mi. E Tamala, Colima; 500 ft alt.

Tamala lies in the valley of a small stream that drains to the southeast for a few miles into the Rio Salado. Immediately southeast of the town is a low limestone ridge that consists of huge stone blocks and fragments that resulted from a subterranean collapse of the ridge. The vegetation in the area is a dense xeric scrub, with little ground cover except for a moderate amount of debris and tuff around the base of the ledge and among the boulders. At the time of my visit during the rainy season snails were found at the base of the ridge aestivating close to the ground on the boulders.

Description of shell (Figs. 1-6): Large. Solid, but not excessively thick, depressed-conical, 0.66-0.78 times as high as wide, acutely carinate at periphery; sides of spire very weakly convex; base below periphery strongly convex; aperture weakly auriculate, with upper lip separated from preceding whorl by deep, narrow cleftlike sinus extending along suture for about $\frac{1}{8}$ of last whorl. Sinus present at all stages of post-embryonic growth, cemented in from behind with progressive shell growth. Aperture oblique in lateral profile. Lip with strong thick reflection along peripheral and basal margin; in lateral profile lip moderately recurved above and slightly more below periphery so that periphery forms broad denticle. Columella moderately arched forward,

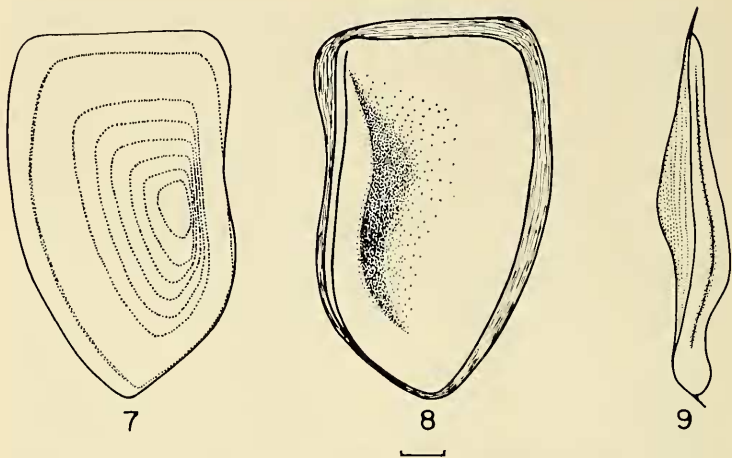


FIGS. 1-6. *Ceochasma phrixina* new species. 1-3, Holotype, UF 20138; 4-6, Paratype, UF 20139.

forming a weak denticle at junction with basal lip; columellar margin of aperture weakly concave. Umbilical callus thin, glossy, smooth, less than $\frac{1}{4}$ shell diameter, with weak, elongate dent at base of columella. Whorls 5.7-6.3 (usually more than 6.0). Embryonic whorls not clearly demarcated from later whorls. First whorl protruding, large, diameter 1.3-1.5 mm. First 2.5 whorls with moderately coarse arched incremental striations and wrinkles; remaining whorls with similar close striations and wrinkles and strong spiral chords that parallel suture and continue to lip; last whorl with 8-11 chords above, 12-19 chords below periphery, with chords below periphery flattened and broader near umbilical region so that spiral sculpture appears more as strongly impressed spiral grooves than as raised chords.

The shell is dull in texture. Two color phases are about equally represented in the type series. The holotype and most of the fresh paratypes are reddish pink dorsally and slightly lighter below. The suture is nearly white, and the periphery and lip are white. The umbilical callus is glossy white, but is thin along its periphery where it shows the underlying color of the shell. The remaining paratypes are similarly colored except that the ground color is lemon-yellow.

	Holotype	Paratypes
height	14.3 mm	12.2-14.6 mm
width	20.4	18.4-20.4
aperture width	11.1	9.8-11.1
whorls	6.3	5.7- 6.3

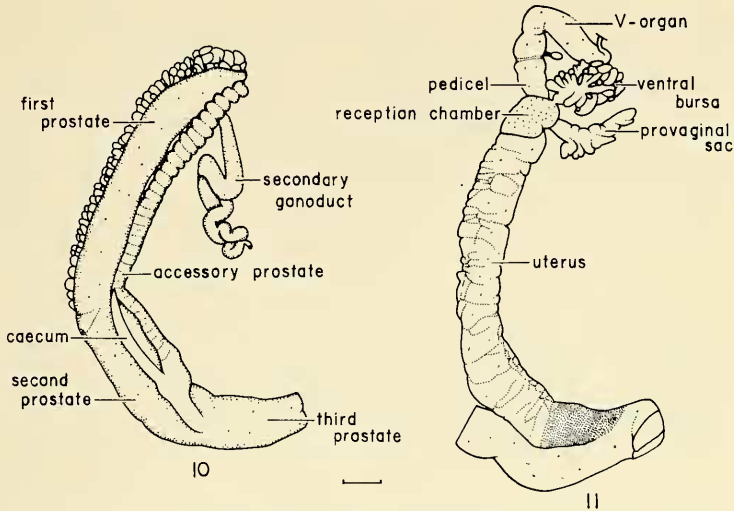


FIGS. 7-9. Operculum of *Coechasma phrixina* new species. 7, inner surface; 8, outer surface; 9, parietal-columellar margin, scale equals 1 mm.

Operculum (Figs. 7-9): Concentric; nucleus acentric, near columellar margin and slightly below middle. Horny portion reddish-yellow, extending beyond margins of calcareous plate. Latter well developed, white, with low oblique lamellarlike projection along columellar margin, and relatively deep impression over nuclear region where plate is thinnest. Columellar margin with shallow but sharp furrow along base of lamellar projection.

Reproductive System: (Terminologies follow Baker, 1926a). Male (Fig. 10) secondary gonoduct greatly enlarged, convoluted, with first prostate about $\frac{2}{3}$ length secondary gonoduct. Right compartment with numerous small globular lobes along left margin. Lobes becoming increasingly complex near apex of first prostate. Second prostate about one half length first prostate and slightly more stocky. Third prostate relatively long, poorly demarcated, with conspicuously thicker walls than second prostate. Accessory prostate almost as long as combined length of first and second prostate; nearly uniform in width, except along some terminal lobes. Basal segment elongate. Caecum about as long as second prostate, very thin-walled.

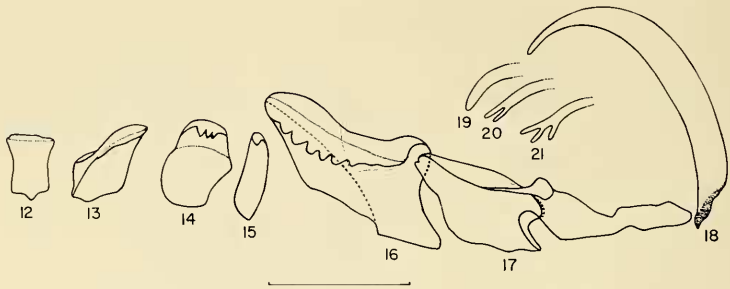
Female (Fig. 11) with right limb of V-organ cylindrical and stocky, left limb constricted near both apex and base. Accessory sperm sac small, elongate, with short duct entering near base of left limb of V-organ. Pedicel stout, well differentiated from left limb. Reception chamber large, demarcated from uterus by deep furrow. Ventral bursa large, with numerous small elongate lobes radiating from central duct. Provaginal sac elongate, furrowed and lobed along outer margin; con-



FIGS. 10, 11. Genitalia of *Ceochasma phrixina* new species. 10, male system; 11, female system.

nected to reception chamber by short stout duct. Basal segment of uterus very deeply pigmented. Adjacent rectum and cloacal region light gray colored.

Radula (Figs. 12–21): (Terminologies follow Baker, 1922) R-central (Fig. 12) a simple shieldlike structure with narrow, irregular cutting edge along upper margin, small projection along basal margin. A- and B-centrals have heavy cusp-bearing backs. A-central (Fig. 13) shoe-shaped, lacks cusps along cutting edge. Occasionally one or two small denticlelike knobs present, irregular in appearance and location. B-central (Fig. 14) irregularly bootshaped, with 2–4 large pointed cusps along cutting margin. Cusps vary in size, relatively small in some specimens. C-central (Fig. 15) simple, spatulate, with single large horny cusp. Capitulum complex (Figs. 16–17) consists of a large, irregular, trapezoidal comb-lateral (Fig. 16) and a very long accessory plate (Fig. 17). The comb-lateral has about 6 well-defined cusps along its cutting margin, and occasional small cusplike lumps may also be present. The accessory plate attaches to the comb-lateral by a short extension that fits under the dorsal crest of the comb-lateral. The main body also has a thin reflection across the top of the main body. The accessory plate also has a long lateral extension that is joined to the main body of the tooth by a sharp sigmoid fold. The marginal teeth (Figs. 18–21) consist of a series of 73–79 teeth per row on each side of the ribbon. The teeth are elongate, sickle-shaped and simple (Fig. 18). The first 11–14 marginals are unicuspid (Fig. 19). The next 7–12 marginals are bicupid



FIGS. 12-21. Radular teeth of *Ceochoasma phrixina* new species. 12, R-central; 13, A-central; 14, B-central; 15, C-central; 16, comb-lateral; 17, accessory plate; Figs. 16 and 17 are combined in their natural relationships to form the capitulum complex; 18, 3rd marginal; 19, 10th marginal; 20, 11th marginal; 21, 21st marginal. Scale equals 100 microns for Figs. 12-18, and 200 microns for Figs. 19-20.

(Fig. 20). The following 6-8 teeth are tricuspid (Fig. 21), and the remaining teeth have 4 or more cusps. The outermost marginals may have as many as 6 cusps. The cusps on all of the marginals are long and digitiform with rounded tips. The addition of cusps on the teeth occurs along the outer margin of the tooth.

Relationship: Baker (1956: 28-30) divided the Helicinidae into two subfamilies, the Helicininae and the Proserpininae, containing five and three tribes, respectively. This classification is based upon earlier studies of the radula (Baker, 1922: 35-64; 1926a: 35-54; 1926b: 449-451; 1928: 46; Pilsbry, 1927: 62-63; Thiele, 1927: 89). In the primitive taxa all of the paired central, lateral and marginal teeth have well developed acuminate cusps. The accessory plate of the capitulum complex is relatively simple in its attachment to the lateral tooth, and has a long lateral extension. The major evolutionary trend in the family is modification and specialization of the capitulum complex and simplification of the central teeth. The marginal teeth undergo relatively slight change (Baker, 1923: 119). Other anatomical modifications have relatively slight phylogenetic importance (Baker, 1926a: 35-54; 1928: 25-46).

The Helicininae include those groups in which all of the marginal teeth have sharp, acuminate cusps, the capitulum complex as a comb-lateral tooth in which the shank is located along the outer margin, and the accessory plate is highly variable. The Proserpininae consists of those groups in which the inner marginals are unicuspid, the outer marginals have only a few large rounded cusps, the capitulum complex has a T-lateral in which the shank is mesially located, and the accessory plate is reduced in size and has a much reduced lateral wing.

The tribes of the Helicininae are not relevant to further discussion because they have no bearing on the relationships of *Ceochoasma*. The

extant tribes of the Proserpininae are the Stoastomini, Vianini and Proserpinini. The Stoastomini retain large cusps on all of the paired central and lateral teeth. The T-lateral apparently is secondarily modified so that it resembles a comb-lateral (Baker, 1928: 46). The shank of the lateral tooth extends to the outer margin, but apparently originates from near the center of the tooth. The Vianini is characterized by having a typical T-lateral and generally a reduction or absence of cusps on the paired centrals and lateral. The Proserpinini has a radula that is hardly distinguishable from that of the Vianini, merely representing a more advanced stage in the functional reduction of the central teeth. However, the tribe is distinct in lacking an operculum and in having well developed spiral lamella in the aperture.

Ceochasma clearly belongs to the subfamily Proserpininae on the basis of its unicuspid inner marginal teeth and the lobate nature of the cusps on the outer marginals. Its relationship within the subfamily is less clear since it shares characteristics with the Stoastomini and the Vianini. *Ceochasma* is similar to the Stoastomini in the appearance of its lateral tooth. It is similar to the Vianini in that it has already lost cusps on the A- and C-centrals. *Ceochasma* is more primitive than any known genus in either tribe. It has an enlarged accessory plate that still bears a pronounced lateral winglike extension, and its lateral tooth has all of the characteristic features of a comb-lateral. I consider *Ceochasma* to be a primitive member of the Vianini in which cusp reduction has already occurred on the central teeth, but which retains a primitive capituliform complex. It probably lies near the stem of the origin of the Vianini and the Proserpininae collectively. The Stoastomini probably diverged prior to this point, but underwent more advanced modifications in its capituliform complex. If this is so then the stoastomid lateral tooth is modified comb-lateral, and not a secondarily modified T-lateral as Baker has suggested (1928: 46).

Other aspects of the soft anatomy and the operculum are of limited use in establishing phylogenetic relationships because of the slight and inconsistent variations that occur in these characters throughout most of the family. However, in its reproductive structures *Ceochasma* strongly resembles *Tristramia*, which Baker (1922: 39, 48) considered the most primitive subgenus of *Helicina*. The female reproductive systems of both groups possess a highly lobate ventral bursa, much more so than occurs in most other groups of the family (Baker, 1926a: 42-44; 1928: 32-33). Additional similarities to *Tristramia* are also evident in the structure of the operculum. The calcareous plate is not as weakly developed in *Ceochasma* as in *Tristramia*, but both are alike in having the horny plate extend beyond the margins of the underlying calcareous plate. They are also alike in the nature and location of the concentric growth rings on the horny plate. Both genera occur together in Colima. In contrast, the Vianini usually does not have the horny plate as extensively developed, and the concentric growth rings are more centrally located or consist of some direct variation thereof.

Although the characteristics of the reproductive system and the operculum cannot be heavily weighed, they do tend to strengthen the allocation of *Ceochasma* as a primitive member of the Vianini.

LITERATURE CITED

- BAKER, H. B. 1922. Notes on the radula of the Helicinidae. *Proc. Acad. Nat. Sci. Phila.*, 74: 29-67, pl. 3-7.
- . 1923. Notes on the radula of the Neritidae. *ibid.*, 75: 117-178; pls. 9-14.
- . 1926a. Anatomical notes on American Helicinidae. *ibid.*, 78: 29-56; pls. 5-8.
- . 1926b. The radula of *Prosperpina*. *ibid.*, 78: 449-451.
- . 1928. Mexican mollusks collected for Dr. Bryant Walker in 1926, I. *Occ. Pap. Mus. Zool. Univ. Mich.*, (1932): 1-65.
- . 1956. Family names for land operculates. *Naut.*, 70: 28-31.
- PILSBRY, H. A. 1927. Notes on the genus *Ceratodiscus*. *Naut.*, 41: 62-63.
- THIELE, J. 1927. *Handbuch der Systematischen Weichtierkunde*, I. Berlin: i-vi, 1-778.